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GEORGE O. SAILE
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EXAMINER

CHEN, TIANJIE

ART UNIT PAPER NUMBER

2652

DATE MAILED: 10/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/613,598

Applicant(s)

TAKANO, KENICHI

Examiner

Tianjie Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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Final Rejection

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1, 5, 17, and 21 are rejected under 35 U.S.C. 102(e) as being anticipated by Gill (US 6,822,836).

Claims 1 and 17: Gill shows a method in Figs. 3 and 4 to enhance stability of a free layer/or a magnetic read head having a free layer with enhanced stability and signal strength (Column 2, lines 21-240), while retaining free layer signal strength, in a magnetic read head, including: providing a pair of opposing permanent (hard) magnet layers 88 (Fig. 3, column 3, lines 57-58) separated by a first gap and magnetized in a first direction 150 (Fig. 4; column 5, lines 50-54), that abut and thereby provide longitudinal bias to the free layer 68; forming, at a distance above the permanent magnet layers 88, a pair of opposing additional bias layers 142 that are separated by a second gap that is less than the first gap; and then magnetizing the additional bias layers in a second direction 164 (Fig. 4) that is antiparallel to the first direction 150.

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Claims 5 and 21; Gill shows that distance above/or below the permanent magnet layer is the sum of the thickness of layers 138 (0.8 nm), layer 134 (8 nm), and layer 130 (5 nm), which is 13.8 nm = 138 Angstroms.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 9, 13, 25, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gill in view of Nagasaka et al (US 2003/0123200).

Claims 9 and 25: as described above, Gill shows a method to enhance stability of a free layer/or a magnetic read head having a free layer with enhanced stability and signal strength, while retaining free layer signal strength, in a magnetic read head, including: providing a pair of opposing permanent magnet layers separated by a first gap and magnetized in a first direction, that abut and thereby provide longitudinal bias to the free layer; forming, at a distance above the permanent magnet layers, a pair of opposing additional bias layers that are separated by a second gap that is less than the first gap; and then magnetizing the additional bias layers in a second direction that is antiparallel to the first direction.

Gill does not show that the additional bias layers are below the permanent magnetic layers.

Nagasaka et al shows that in a magnetoresistive head the layers can be stacked in a forward direction (top-type layers) and also can be stacked in a backward

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direction (bottom-type layers) ([0053]). One of ordinary skill in the art would have been motivated to include the backward-stacked configuration as an alternative in Gill's device. In thus constructed device, the additional bias layers are below the permanent magnetic layers.

Claims 13 and 29, Gill shows that distance above/or below the permanent magnet layer is the sum of the thickness of layers 138 (0.8 nm), layer 134 (8 nm), and layer 130 (5 nm), which is $13.8 \text{ nm} = 138 \text{ Angstroms}$.

3. Claims 2-5, 6-8, 10-12, 14-16, 18-20, 22-24, 26-28, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gill/or Gill and Nagasaka et al in view of Fukui et al (US 2004/0047087).

Claims 2, 10, 18, and 26; Gill/ or combination of Gill and Nagasaka et al does not show coercivity in detail.

Fukui et al further shows a magnetic head wherein the additional bias layer is CoFe/IrMn ([0044] line 9) whereby it has good exchange coupling field with antiferromagnetic layers. Fukui et al further shows that the permanent magnet layer should have coercivity of 2 KOe ([0029] lines 3-4). And the resulted coercivity is the difference between the coercivity of the permanent magnet and the coercivity of the additional bias layer. In instance case, the resulted coercivity is 1 KOe ([0029] lines 1-2), the coercivity of the permanent magnet is 2 KOe. Therefore, the effective coercivity of the additional bias layer is $2 \text{ KOe} - 1 \text{ KOe} = 1 \text{ Koe}$; which is 0.5 times that of the permanent magnetic layer.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to apply the material having specified coercivity into Gill (and Nagasaka et al)'s device. The rationale is as follows: Fukui et al teaches that in the

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particular system, the coercivity of the film can be optionally controlled ([0029, line 12-14). One of ordinary skill in the art would have been motivated to apply the configuration for controlling the coercivity.

Claims 3, 11, 19, and 27; Gill shows that the layer 120 has a thickness of 6-14 nm (Column 6, lines 58-59, layer 130 has a thickness of 1-5 nm, layer 134 has a thickness of 2-3 nm, and layer 138 has a thickness of about 1 nm. It leads to that layer 142 would have a thickness of 0-8 nm. Gill shows that the permanent magnetic layer has a thickness of the summation of the magnetoresistive element of $54+58+64+92$, but does not specify the thickness.

Fukui et al shows a similar magnetoresistive head, wherein the thickness of the magnetoresistive element of layers $100+101+102+103+104$ has thickness of 28.8 nm ([0028]). One of ordinary skill in the art would have been applied the thickness specified by Fukui et al into Gill (and Nagasaka et al)'s device. In the resulted device, the additional bias layer is deposited to a thickness that is 0.02 microns (20nm) less than that of the permanent magnet layer.

Claims 4, 12, 20, and 28; Gill does not specify the width of the gap. Fukui et al shows that the first gap and the second gap should be the track width, which are between about 0.1 and 0.2 microns ([0008] lines 1-3; and Fig. 11) and it provides narrow track having high sensitivity and stability ([0012]). One of ordinary skill in the art would apply this width for getting high sensitivity and stability.

Claims 6-8, 14-16, 22-24, and 30-32: Gill shows that his invention can be used for any GMR magnetic head (Column 8, lines 9-13). Fukui et al shows the magnetic read head is a CIP GMR head/a CPP GMR head/a TMR head ([0049]), which are all

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GMR head, One of ordinary skill in the art would have recognized that Gill's head including all type listed above.

Response to Arguments

4. Applicant's arguments with respect to independent claims 1, 9, 17, and 25 and the dependent claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tianjie Chen whose telephone number is (703) 305-7499. The examiner can normally be reached on 8:00-4:30, Mon-Fri.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen can be reached on (703) 305-9687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


TIANJIE CHEN
PRIMARY EXAMINER